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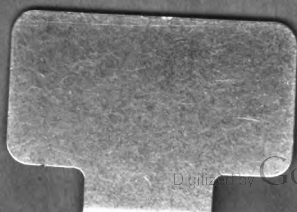
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and
C. B. DOYLE

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CONTRIBUTIONS

FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 16, PART 6

THREE NEW GENERA OF STILT PALMS
(IRIARTEACEAE) FROM COLOMBIA,
WITH A SYNOPTICAL REVIEW
OF THE FAMILY

By O. F. COOK and C. B. DOYLE



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II

PREFACE.

This paper on South American palms, by Messrs. O. F. Cook and C. B. Doyle of the Bureau of Plant Industry, U. S. Department of Agriculture, is chiefly devoted to descriptions of three new genera of the family Iriarteaceae and the three new species which serve as generic types. All three genera were found in the forests of the Pacific coast of Colombia, near Buenaventura, in a region that seems not to have been visited by earlier students of this group of plants. The specimens, with notes, measurements, and photographs, were secured in 1905, when Mr. Doyle accompanied Prof. H. Pittier, also of the Bureau of Plant Industry, during a visit of agricultural exploration in Colombia.

As much of the literature of the palms is based on rather fragmentary information, these more complete data, drawn from fresh material, will be appreciated. One of the results of the present study is to show the desirability of a subdivision of the family Iriarteaceae into three tribes, a synopsis of which is included. Synopses and descriptions are also given of the genera and species of the two tribes in which the new genera are placed.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium.

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THREE NEW GENERA OF STILT PALMS (IRIARTEACEAE) FROM COLOMBIA, WITH A SYNOPTICAL REVIEW OF THE FAMILY.

BY O. F. COOK AND C. B. DOYLE.

FAMILY CHARACTERS.

The palms of the strictly American family Iriarteaceae are readily distinguished in nature by the fact that the trunk does not reach the ground but is supported by a cluster of large, stilt-like, aerial roots. In the smooth trunk and the long sheathing bases of the leaves the stilt palms have a superficial resemblance to the royal palms (*Acris-taceae*), but the floral and foliar characters show altogether different lines of specialization.

The leaves of the Iriarteaceae differ from those of any other pin-nate palms in the strong development and radial position of the veins. Even when the segments are narrow and parallel so that the clusters closely resemble the pinnæ of other palms, there is no specialization of a definite midvein larger than the others. This lack of specialization may be considered an explanation of the peculiar irregular or premorse margin of the leaves, a feature that is par-alleled, among American palms, only in certain genera of Co-caceae, such as *Tilimia* and *Curima*.

SURVEY OF THE GENERA.

The classification of *Iriartea* and the related genera has received very diverse treatment at the hands of Martius, Karsten, Wendland, and Drude. The very incomplete original description of *Iriartea* by Ruiz and Pavon was supplemented by Martius from his knowledge of the Brazilian species. Karsten in establishing two new Colom-bian genera, *Deckeria*¹ and *Socratea*,² accepted the characters as-cribed to *Iriartea* by Martius and thus invited criticism by Wendland for not considering the true type of the genus, the Peruvian *I. deltoidea*.

¹ *Linnaea* 28: 258. 1856.

² *Op. cit.* 28: 263. 1856.

Finding in the female flowers of *I. deltoidea* the series of rudimentary stamens which Karsten had considered distinctive of his genus *Deckeria*, Wendland reunited this to *Iriarte*, though he accepted Karsten's second genus *Socratea* as well founded. Three new genera, *Iriartella*,¹ *Catoblastus*,² and *Dictyocaryum*, were proposed by Wendland, who also transferred to this group the genus *Wettinia*, previously established by Poeppig and Endlicher, but not at first recognized as a palm because of its peculiar, somewhat cycad-like inflorescence.

Wendland's association of Karsten's *Deckeria* with *Iriarte* was later found by Drude³ to have been a mistake, for the type species of *Iriarte* proved to have the embryo basal instead of lateral, as Wendland had supposed, and to have the first leaves divided, as well as the terminal segments of the adult leaves, which are united in *Deckeria*. The spadix of *Deckeria* has thickened branches, with the flowers inserted in pits. Thus Karsten's genus *Deckeria* must evidently be retained, making seven genera which Wendland would probably have recognized if he had been acquainted with the fruits of the type species of *Iriarte*. In distinguishing these genera, Wendland relied largely on the fruits, but Drude has supplied additional characters by which some of the groups can be more readily separated.⁴

The seven genera could be arranged in two series with reference to the distribution of the flowers. One series is characterized by the presence of functional flowers of both sexes in the same inflorescence, the other by having flowers of the two sexes in separate inflorescences, though still on the same individual. The first series, with the flowers of the two sexes together, is composed of the five genera *Iriarte*, *Dictyocaryum*, *Deckeria*, *Socratea*, and *Iriartella*, leaving *Catoblastus* and *Wettinia* for the other series with the flowers of the two sexes separated.

In Drude's classification of the palms, in Engler and Prantl's *Natürlichen Pflanzenfamilien*,⁵ the genera *Catoblastus* and *Wettinia* are associated with *Iriarte*. They differ very distinctly in the characters of the flowers, having the sexes separated in different inflorescences and the carpels unequally developed, only one producing a normal ovule. Of the three new forms described in the present paper, two may be considered to be intermediate between *Iriarte* and *Wettinia*, in that male flowers are still present in rudimentary form on the pistillate inflorescence. The first of these is more

¹ *Bonplandia* 8:103. 1860.

² See p. 231, below.

³ *Bonplandia* 8:106. 1860.

⁴ See Mart. Fl. Bras. 3²: 535. 1882.

⁵ 2¹: 60, 61. 1889.

closely associated with *Iriarte* in having the carpels of the young flowers equally developed, but the petals are narrow and separate, while those of *Iriarte* are broadly imbricate. The embryo is also basal instead of being lateral or apical as in most of the species referred to *Iriarte*.

The second of the new types, also with rudimentary male flowers on the pistillate inflorescence, has the carpels extremely unequal, even more so than in *Catoblastus*, and entirely lacks a style. The sharply three-lobed, star-like stigma is seated at the base of the long, subcylindrical fertile carpel. The albumen of the seed differs from that of *Catoblastus* in being quite uniform, instead of ruminant.

The third of the new forms has the sexes entirely separated as in *Wettinia* and the pistillate flowers and fruits closely crowded together as in that genus, but the inflorescence is branched instead of simple, and the long, narrow petals are separate instead of overlapping at the base as in *Wettinia*.

The fruits of the last species, though narrowed and angled at the base by mutual pressure, remain shorter than those of the other two species, which are scattered upon the longer branches and are of a regular long-oval form. In all three species the surface is rough and hairy and the outer layer or pericarp has a loose corky texture not a little suggestive of that of the fruits of *Manicaria* and *Phytelephas*.

TRIBAL DIVISION.

Taking these additions into account, a division of the family into three tribes seems desirable. Though *Catoblastus* and *Wettinia* seem to agree in some of the characters that separate them from *Iriarte* and its immediate relatives, they are very unlike in other important respects. Moreover, *Catoblastus* and *Wettinia* no longer appear as isolated genera, but rather as members of two series of related genera, like those that cluster about *Iriarte*.

SYNOPTICAL KEY TO THE TRIBES.

- Flowers of both sexes borne on the same spadix; a single inflorescence in the axil of each leaf..... **IRIAETAE.**
- Flowers of the two sexes in separate inflorescences; several inflorescences from each axil.
- Flowers and fruits scattered on the numerous slender branches of the inflorescence; styles short or wanting. **CATOBLASTAE.**
- Flowers and fruits densely crowded on the thickened simple or few-branched spadix; styles long and slender.... **WETTINIAE.**

DESCRIPTIONS OF THE COLOMBIAN GENERA AND SPECIES.

CATOBLASTEAE.

SYNOPTICAL KEY TO THE GENERA.

- Pistillate flowers with three equal carpels at the time of flowering *ACROSTIGMA* (p. 228).
 Pistillate flowers with one greatly enlarged fertile carpel at the time of flowering.
 Petals not imbricate; stigma sessile at the base of the long, cylindrical fertile carpel..... *CATOSTIGMA* (p. 230).
 Petals imbricate at base; stigma rostrate or borne on a columnar style..... *CATOBLASTUS* (p. 231).

ACROSTIGMA gen. nov.

Trunk solitary, rather short (6 meters long) not so thick below (10 cm.) as above (16 cm.); smooth, distinctly ringed; internodes short (10 cm.)

Leaves with rather short sheaths (120 cm. long); pinnæ triangular-lanceolate, not inserted on a fleshy pulvinus; petiole short (16 to 18 cm. long); segments of unequal length, united; both surfaces smooth; terminal pinnæ broad, united to near the end.

Spathes 5 or 6, two or three of them small, basal, three large.

Spadix compound, divided near the middle into several (about 5) long, tapering, flexuous branches; female inflorescence bearing irregularly scattered flowers each subtended by 2 minute rudiments of male flowers; female flowers with sepals rounded-triangular, broader than long, slightly connate at base; petals triangular, nearly as broad as long, less than twice as long as the sepals, distinctly separated at base, soft and fleshy in texture, not ribbed on the back; staminodes 6, minute, delicate, of soft texture, less than one-fourth the length of the sepals; pistil triangular with three equal lobes, not exceeding the petals; stigmas completely sessile, forming a minute 3-pointed slit in the apex of the pistil.

Fruit elliptical, slightly compressed and slightly angled on one side above the stigma, one and one-half times as long as broad. Stigmas persistent at base, close to the persistent calyx; sepals united at base, one much larger than the other two; mesocarp of rather loose, corky, granular texture, composed of coarse cellular tissue and coarse, irregular fibres, often spine-like; inner surface of mesocarp closely and obscurely wrinkled without evident indication of a fibrous network as in *Catostigma*; numerous bundles of raphids imbedded in the mesocarp immediately around the inner surface; endocarp rather thick and corky, covered with a very close network of rather coarse, strongly flexuous fibres.

Seed compressed-oval, smooth or very faintly impressed under the fibres of the endocarp; albumen uniform; embryo basal, extremely small, not covered by the albumen, indicated by a minute rounded prominence on the outer wall of the very small cavity.

Type species, *Acrostigma equale*.

Distinguished from *Catoblastus* Wendl. in having the pistil formed of three equal carpels with minute sessile stigmas, and by the presence of rudimentary male flowers in the female inflorescences.

Acrostigma equale sp. nov.

PLATE 54 (A), 55, 56 (A), 57, 58.

Trunk 6 meters long by 10 cm. in diameter at 1 meter from base, becoming thicker toward the crown, there reaching a diameter of 16 cm.; internodes 10 cm. or less in length.

Leaves 8 to 12 in a head, largest in the middle, tapering gradually toward base and tip; leaf bases 120 cm. long by 50 cm. broad at base, splitting into numerous fragile fibers; petiole short, 16 to 18 cm. long by 4 cm. in diameter; lower surface rounded and covered with dark brownish tomentum; upper surface rounded and also tomentose, excepting a central strip 1 cm. wide, light green in color, free from tomentum or scurf and running the entire length of the petiole.

Rachis 350 cm. long by 4 cm. in diameter at base, gradually tapering toward the tip; lower surface rounded, becoming flat toward the tip, sparsely covered with greenish tomentum; upper surface with a prominently rounded central ridge 6 to 8 mm. wide at base, gradually becoming narrowed to a sharp ridge; on either side of this median ridge a shallow groove, in this the pinnæ inserted; the surfaces of these grooves, as well as of the central ridge, marked with about 12 longitudinal, slightly elevated ridges or striations, these 1 to 2 mm. apart, covered with very loosely adherent, brownish, scurfy material easily detached with the finger; toward the end of the leaf the grooves becoming shallow and disappearing; below each pinna for a distance of about 2 cm. the rachis entirely free from scurf or tomentum, but the striations still distinct; these naked spots of much lighter color and visible at some distance from the tree; upper central ridge slightly lighter in color than the grooves, toward the end of the leaf taking on the same color as the naked spaces below the pinnæ; striations and naked spots also disappearing toward the end of the leaf, the last three or four pinnæ thus inserted on a comparatively smooth rachis.

Pinnæ 33 or 34 on each side, consisting of 11 to 18 segments; upper surface dark green; lower surface slightly lighter, smooth; midribs very prominent on the under side, raised 1 to 2 mm. above the surface and of much lighter color; segments of pinnæ unequal, premorse, the lower segments of each pinna being the longest; lowest pinnæ 34 cm. long by 7 cm. wide, consisting of 7 or 8 segments 1 cm. or less in width, 1.5 cm. wide at point of insertion; middle pinnæ 105 cm. long by 16 cm. wide at the broadest part, 5 cm. wide at base, consisting of 15 segments 2 cm. or less in width; terminal pinnæ 28 to 34 cm. long by 10 to 15 cm. broad, becoming 19 to 24 cm. wide at insertions, consisting of from 12 to 16 segments 2 cm. or less in width.

Inflorescence infraxillary, 105 cm. long; peduncle 36 cm. long by 6 cm. wide at base, the fruiting portion 10 cm. long by 2 cm. in diameter; branches 5, the longest 59 cm. by 1.5 cm.; peduncle and bases of branches densely hirsute; flowering portion when young with a very sparse covering of long, gland-tipped hairs, these also occurring on the petals and pistils; between the hairs the surface appearing naked, but seen to be very minutely papillose under sufficient magnification; flowers inserted in depressions, these continued on each side to form a distinct transverse groove accommodating the rudimentary male flower.

Spathes 5, the outer 12 cm. long; inner spathe densely covered, when young, with soft silky hairs 2 mm. or less in length.

Fruits 40 to 50 on each branch, ovoid or slightly flattened on one side, 5 cm. long by 3 cm. in diameter or less, covered with closely adherent grayish hairs like those on the branches and peduncle; pericarp corky, 5 mm. thick, tough; kernel 3 cm. long by 1.5 cm. in diameter, ovoid or slightly flattened, the outer surface covered with a web-like coating of closely adherent fibers.

Type in the U. S. National Herbarium, nos. 690426-690428 (all from one tree), collected in deep, marshy forests about Cordoba, Cauca, Colombia, by C. B. Doyle, December, 1905.

Native names, "zancona" or "zancuda," meaning "stilt" or "mosquito" palm, evidently in allusion to the long aerial roots. Also called "crespa," perhaps with reference to the stiff leaves or to the hairy fruits.

EXPLANATION OF PLATES 54-58.—Plate 54, whole leaf and inflorescence, *A. of Acrostigma equale*; B, of *Wettinella quinaris*. From field photographs taken at Cordoba, Cauca, Colombia, December, 1905. Plate 55, tip of leaf of *Acrostigma equale*. From a photograph taken in Washington. Reduced. Plate 56, bases of pinnae, *A. of Acrostigma equale*; B, of *Catostigma radiatum*; C, of *Wettinella quinaris*. All natural size. From photographs of dried specimens taken in Washington. Plate 57, young spathes and female flowers of *Acrostigma equale*. From a field photograph taken at Cordoba, Cauca, Colombia in December, 1905. Natural size. Plate 58, fruit and female flowers of *Acrostigma equale*. From field photographs taken at Cordoba, Cauca, Colombia, December, 1905. Natural size. All photographs taken by C. B. Doyle.

CATOSTIGMA gen. nov.

Trunk solitary, rather short (6 meters), slender (7 to 8 cm. thick), tapering upward; surface smooth, distinctly ringed; internodes rather short (16 cm.), becoming shorter above (10 cm.).

Leaves with rather short sheaths (108 cm.), densely brown-tomentose without; petiole rather long (34 cm.), cylindrical, smooth, and naked; pinnae triangular, the lower unequally divided into 5 to 7 obliquely diverging segments, each segment inserted on a fleshy pulvinus; tips of pinnae irregularly notched; both surfaces smooth; terminal pinnae rather narrow, completely united, the rachis continued to margin.

Inflorescence with 5 spathes, 3 short basal ones and 2 complete ones; also two or three spatheless ring-scars; spadix compound, divided below the middle into a few (about 3) long, tapering, flexuous branches bearing irregularly scattered flowers and fruits; surface not hirsute but very minutely granular-hispid; female flowers inserted in shallow rounded depressions, each subtended by two rudimentary male flowers, one on either side.

Female flowers with sepals subtriangular, somewhat broader than long, slightly connate at base; petals triangular, pointed, twice as long as broad, about 4 times as long as the sepals, distinctly separated at base, in texture firmly coriaceous, distinctly 5-costate on the back, the middle rib strongest; staminodes 6, of firm texture, conic-subulate, about half as long as the sepals, strongly reflexed, opposite and alternate with the petals; pistils distinctly 3-lobed, the fertile carpel conic-cylindric, about 3 times as long as broad, greatly exceeding the others (about 7 times as long), twice as long as the petals, stigmas about twice as long as broad, triangular-conic, sharp-pointed, strongly recurved, strongly rugose-tuberculate; rudimentary male flowers accompanying the female containing a cluster of minute staminodes.

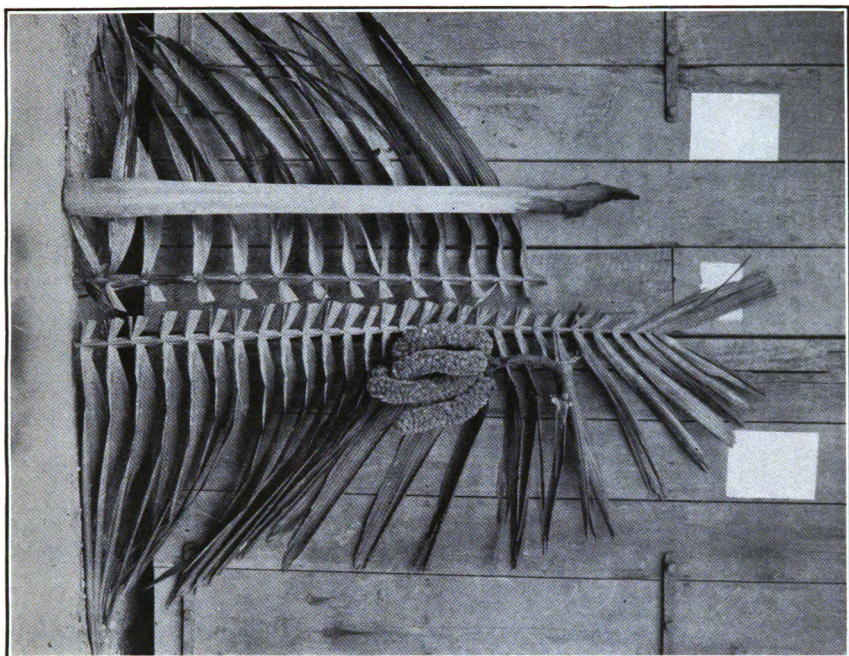
Fruits narrowly oval, symmetrical, about two and one-half times as long as broad; surface even, minutely granular-tuberculate, bearing the persistent stigmas at the base, close to the persistent calyx, one lobe of this distinctly larger than the other two; mesocarp of a rather firm corky texture, composed of coarsely cellular material and stout irregular fibers; inner surface of mesocarp showing an open-meshed network of distinct, slender fibers similar to the fibers of the endocarp, but entirely separate, often with a layer of gelatinous material between; endocarp delicately membranous, the fibers very delicate, not very numerous, those of the inner layer parallel at the base on the side opposite the embryo, anastomosing into a fine network on the other side.

Seed narrowly oval, its surface smooth and even or with very faint impressions; albumen uniform except for a median canal and a semielliptic cavity at the base, the cavity as broad as long, covered by a rather thick lid of albumen to which the disk-like or top-shaped embryo is attached.

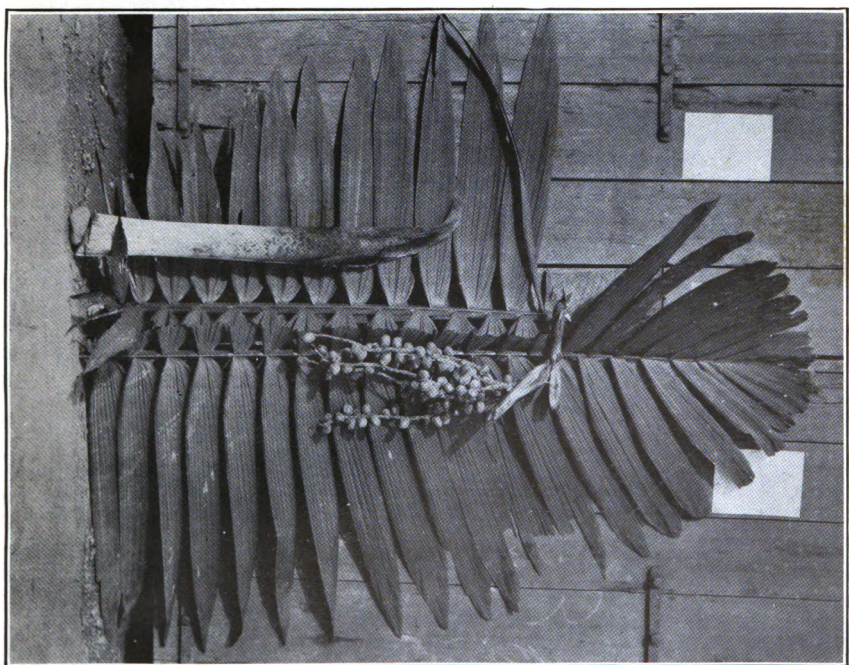
Type species, *Catostigma radiatum*.

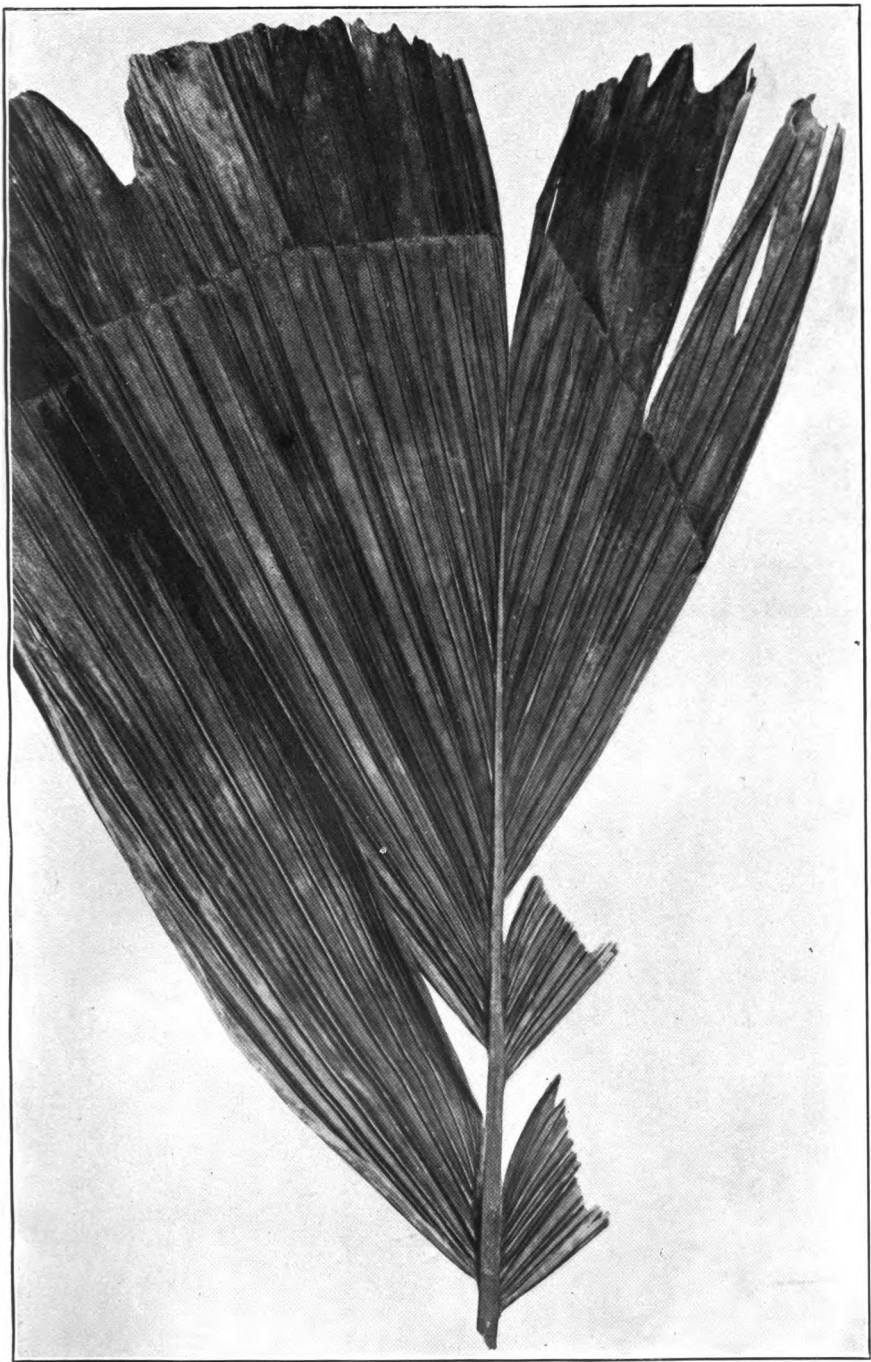
Distinguished from *Catoblastus* Wendl. by the narrow spathes, slender inflorescences, and large, strongly recurved, sessile stigmas, and by the presence of rudimentary male flowers on the female inflorescences.

A. *ACROSTIGMA EQUALE* COOK & DOYLE.

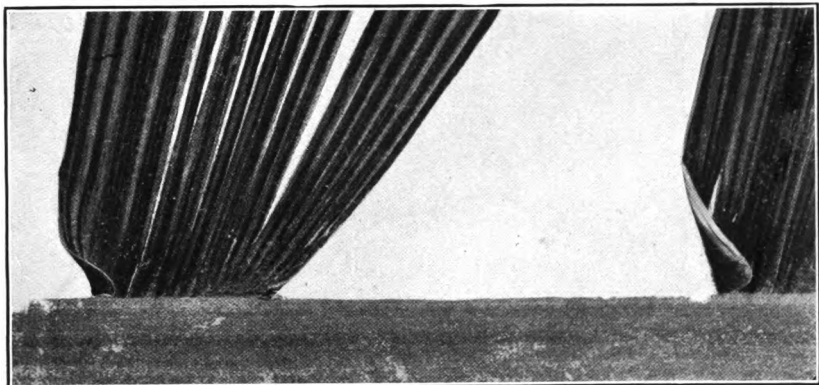


B. *WETTINELLA QUINARIA* COOK & DOYLE.

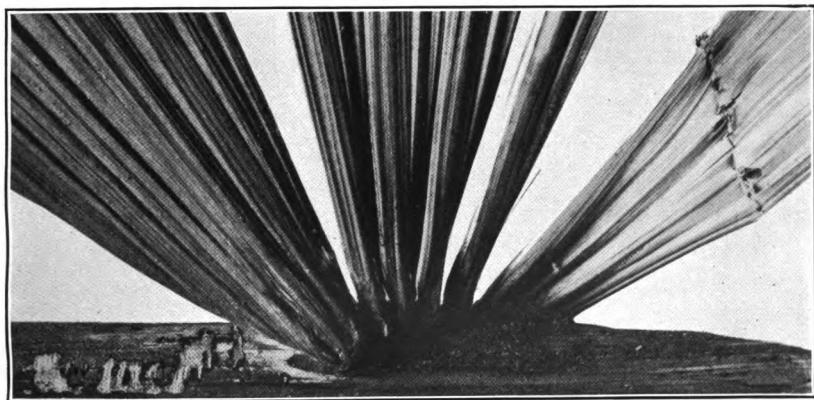




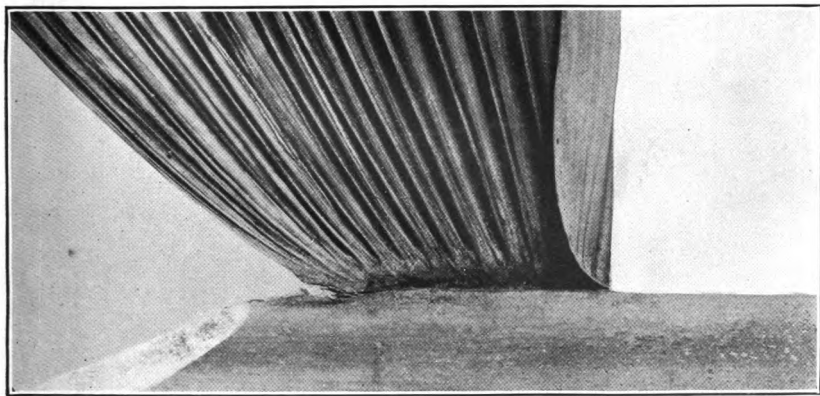
ACROSTIGMA EQUALE COOK & DOYLE.



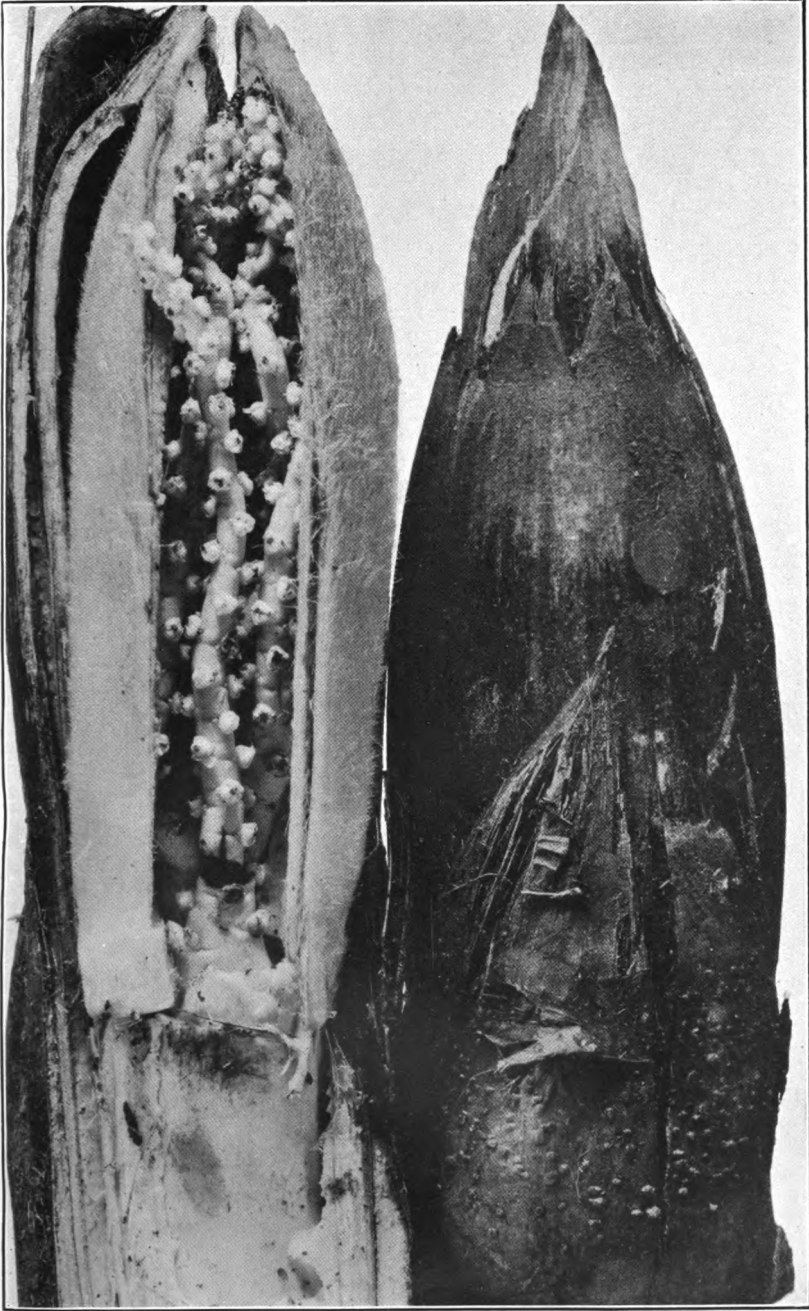
A. *ACROSTIGMA EQUALE* COOK & DOYLE.



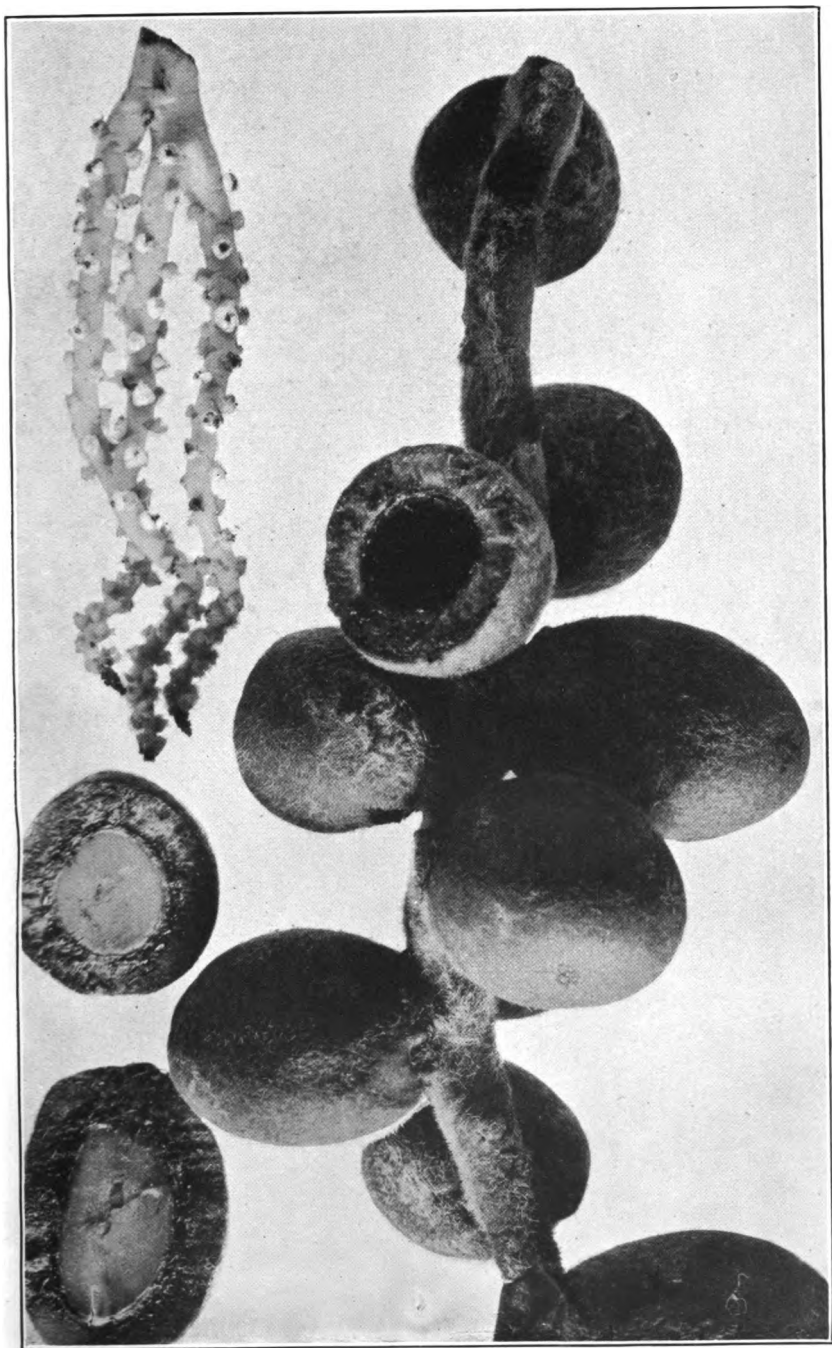
B. *CATOSTIGMA RADIATUM* COOK & DOYLE.



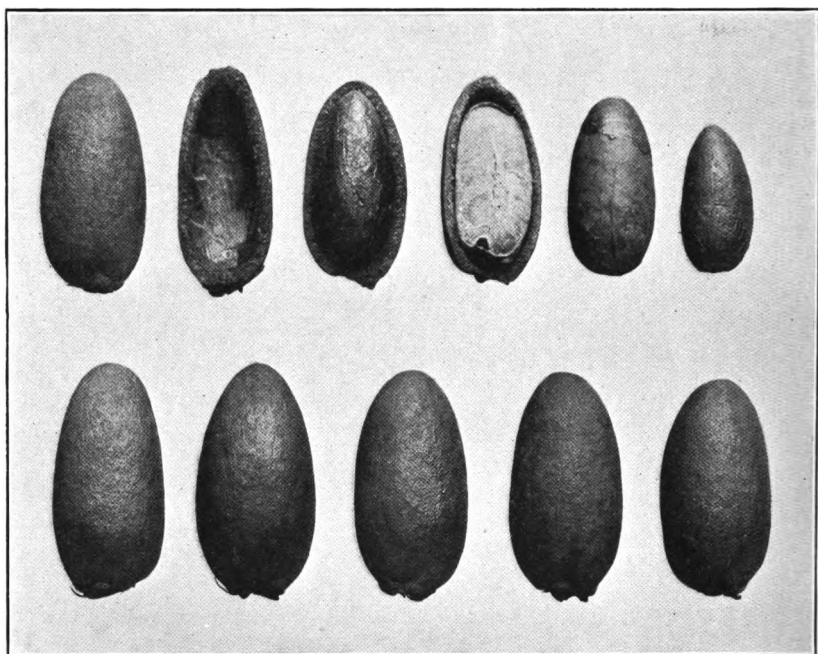
C. *WETTINELLA QUINARY* COOK & DOYLE.



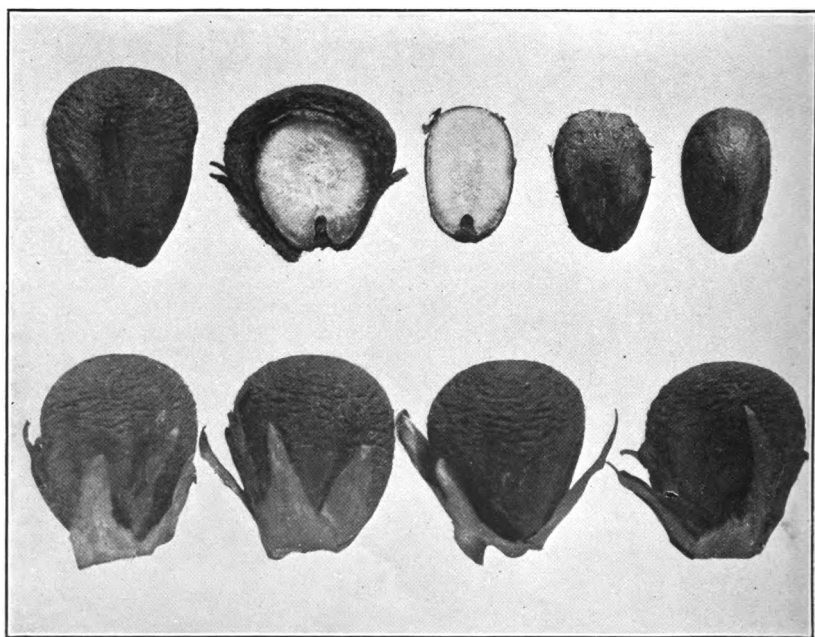
ACROSTIGMA EQUALE COOK & DOYLE.



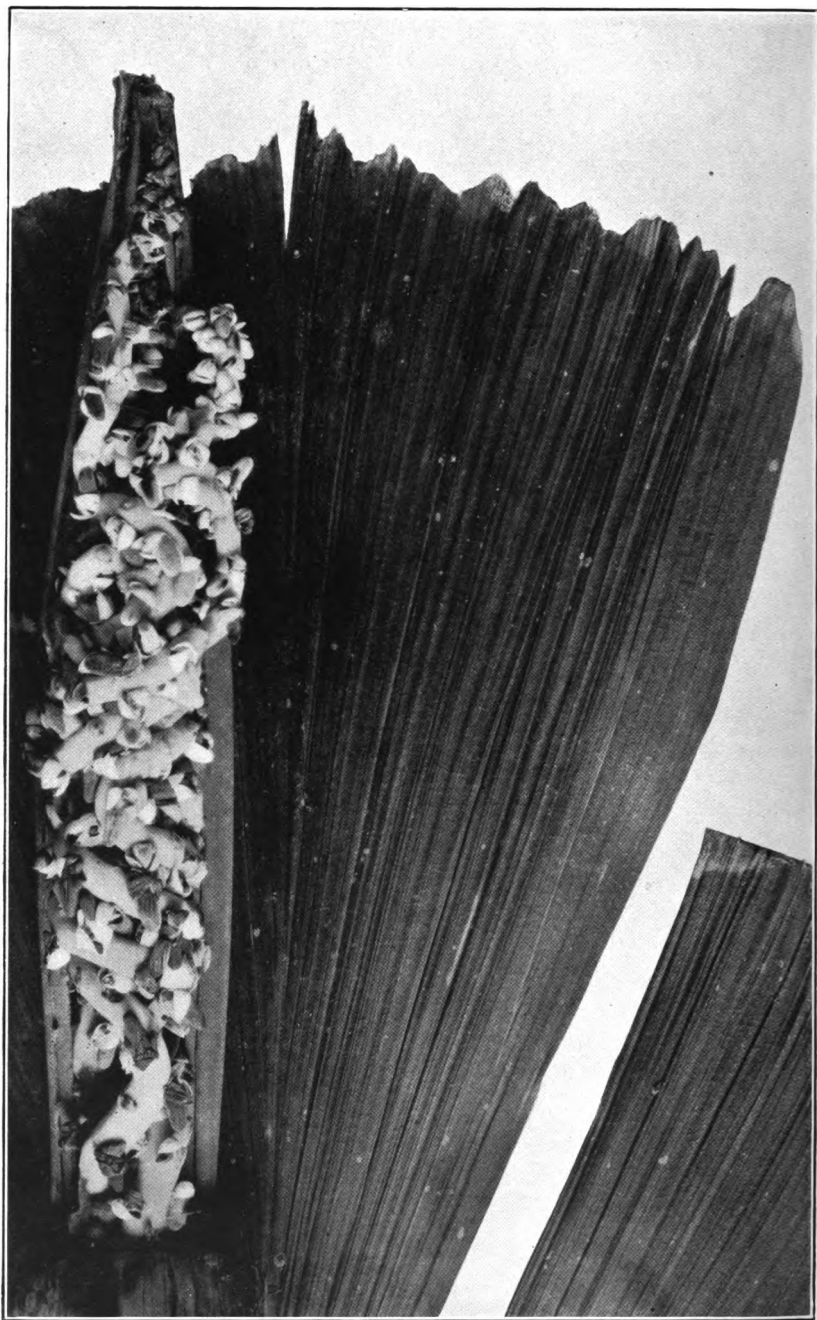
ACROSTIGMA EQUALE COOK & DOYLE.



A. FRUITS OF CATOSTIGMA RADIATUM COOK & DOYLE.



B. FRUITS OF WETTINELLA QUINARIA COOK & DOYLE.



CATOSTIGMA RADIATUM COOK & DOYLE.

Catostigma radiatum sp. nov.

PLATES 56 (B), facing p. 230, 59 (A), 60.

Trunk 6 meters long, 5 meters to first inflorescence, the diameter 7 to 8 cm. at 1 meter from base, 6.5 cm. at base of first leaf; wood very hard and fibrous.

Leaves 10 to 12 in a head, largest in the middle, tapering gradually toward base and tip; leaf bases 108 cm. long, splitting into numerous fragile fibers; lower surface densely brown tomentose for about one-half its length; petiole 34 cm. long by 2.5 cm. in diameter, cylindrical; surface densely tomentose in young leaves, smooth in adult specimens; rachis 272 cm. long by 2.5 cm. thick at base, tapering gradually toward the tip; lower surface rounded, becoming flat; upper surface for 50 cm. outward from base with a prominent, rounded, central ridge becoming more prominent; upper surface also marked with minute grooves; toward the tip the latter disappearing and becoming flat surfaces, the central ridge becoming more prominent; upper surface also marked with minute longitudinal raised lines running the entire length of the leaf, less prominent toward the tip.

Pinnæ 57 to 62 on each side, simple or split into 2 to 7 divisions and consisting of from 1 to 10 segments ranging in width from 1 to 3 cm., the divisions standing at different angles to the rachis; tips of pinnæ notched, due to unequal termination of segments, the lower segments generally the longest; upper surface of pinnæ dark green, the lower surface lighter; at the point of insertion of each pinna a fleshy cushion or pulvinus; just below the insertion of each pinna the rachis naked and lighter in color for 2 cm. or less; for 2 to 3 cm. below the insertion of each group of pinnæ the lower surface clad with a dense tomentum easily removed with the fingers; lowest pinnæ 29 cm. long by 6 to 7 cm. wide, consisting of 6 segments 1 cm. or less in width; lower and terminal pinnæ inserted singly; middle pinnæ 33 to 56 cm. long by 4.5 to 13 cm. wide, consisting of 2 to 9 segments 2 cm. or less in width; terminal pinnæ 17 cm. long by 7 to 9 cm. wide, consisting of 8 or 9 segments 2 cm. or less in width.

Inflorescences infrafoliar, as many as five maturing fruit at one time; total length 105 cm.; peduncle to first branch 30 cm. long by 2.5 cm. in diameter at base and 2 cm. at first branch; fruiting portion 4 cm. long by 1.5 cm. in diameter; both peduncle and fruiting portion light green, smooth; branches 3 or 4, 71 cm. or less in length by 2 cm. in diameter.

Spathes 5, the lowest 4 cm. long by 4 cm. in width at base; inner spathe 26 cm. long, smooth; usually three inflorescences, two male and one female, appearing in a group at the same node.

Fruits densely clustered along the branches, oval 3.5 cm. long, 1.8 cm. in diameter; outer husk corky, brittle, 2 to 3 mm. thick; seed broadest below the middle, covered with a closely adherent, fibrous, fragile epidermis; texture bony; embryo basal.

Type in the U. S. National Herbarium nos. 690429-690432 (all from one tree), collected along bank of stream near Cordoba, Cauca, Colombia, by C. B. Doyle, December, 1905.

Native names, "gualte," "sape."

EXPLANATION OF PLATES 59, 60.—Plate 59, A, fruits of *Catostigma radiatum* Cook & Doyle; B, of *Wettinella quinaria* Cook & Doyle. Plate 60, young spathe and tip of leaf of same species. From field photographs taken at Cordoba, Cauca, Colombia in 1905, the latter in December. All natural size.

CATOBLASTUS Wendl.

Catoblastus Wendl. Bonplandia 8: 104. 1860.

Trunks slender, cespitose, supported on a cluster of short superficial roots.

Leaves 3 to 4 feet long, with 24 pairs of simple pinnæ.

Inflorescences in verticillate clusters, 10 to 12 inches long.

Spathes numerous, the outer short.

Male flowers in pairs; sepals valvate, pistillodes small.

Female flowers with separate sepals and petals; staminodes none (Wendland); present in the type species (Klotzsch); ovary trilocular.

Fruits oblong-ovate; stigma scar close to the base; epicarp subrugose or puberulous; mesocarp grumous; endocarp membranous.

Seeds oblong-ovate with immersed bundles rising from the base on the ventral side, running close together to the apex, then anastomosing and coming together again at the embryo; albumen ruminant (Wendland) or uniform (Klotzsch); embryo basal, erect.

Type species, *Catqblastus praemorsus*.

Catoblastus praemorsus (Willd.) Wendl. Bonplandia 8: 104. 1860. PLATE 61.

Oreodoxa praemorsa Willd. Mém. Acad. Sci. Berlin 1804: 36. 1807.

Iriarteia praemorsa Klotzsch, Linnaea 20: 448. 1847.

Trunks erect, cylindrical, very smooth, 12 to 15 meters high; stoloniferous.

Leaves pinnate, very long, the pinnæ broadly cuneiform, narrowed at base, unequally premorse-dentate at apex, alternate; color dark green.

Fruit ashy gray, ovate; seed ovate, of the size of a pigeon's egg; endosperm brown, marbled with numerous veins.

Forests of the high mountain chain of Buenavista, Province of Caracas, Venezuela, growing with *Oreodoxa acuminata*, but much more rare.

The natives call this palm "pyra," a name they apply to all the palms which have terminal buds that can be used for food.

The above data are drawn from Willdenow's original description. The species was described at greater length by Klotzsch, but it does not appear certain that he had the same palm; at least the particulars differ considerably, as may be judged from the following transcription of additional or divergent facts:

Trunks about 15 from the same root, 30 to 50 ft. long, 3 inches thick, borne on a cluster of warty brown roots about as thick as the little finger.

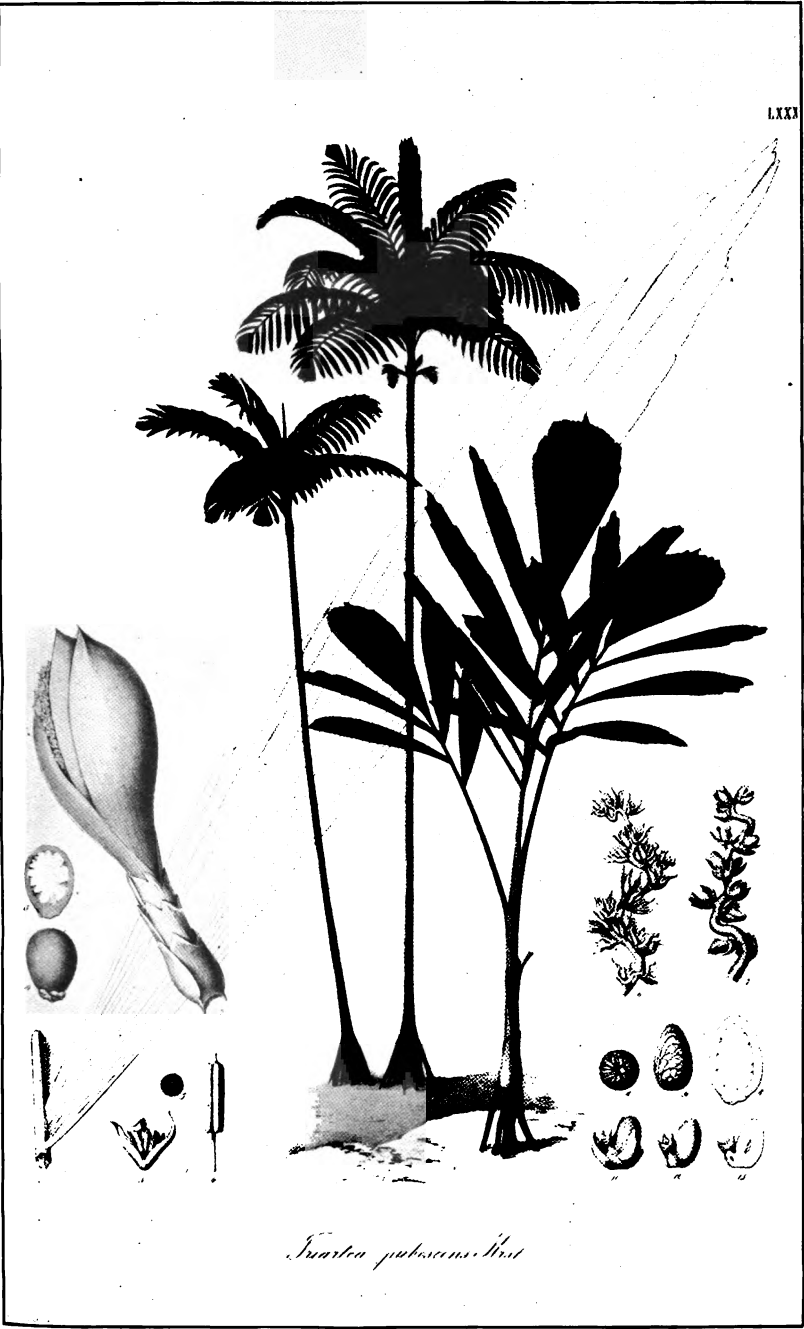
Leaves 3 to 4 feet long; rachis compressed, margined above, and with the margin pubescent; pinnæ 5 to 24 pairs, 10 to 12 inches long, 1½ to 2½ inches broad, alternate, herbaceous, pale green, distant, nearly smooth, irregularly rhomboidal-cuneate, united at the base, repand-erose toward the apex, below with 6 to 8 parallel, prominent veins; terminal pinna flabelliform, at apex dentate-truncate, sometimes bifid, short-cuneate at base, 7 to 11 inches long, 6 to 9 inches broad.

Spadices numerous (10 to 20), cylindric-fusiform, 10 to 12 inches long, 2½ inches broad, thickened near the apex and obtusely pointed, narrowed toward the base.

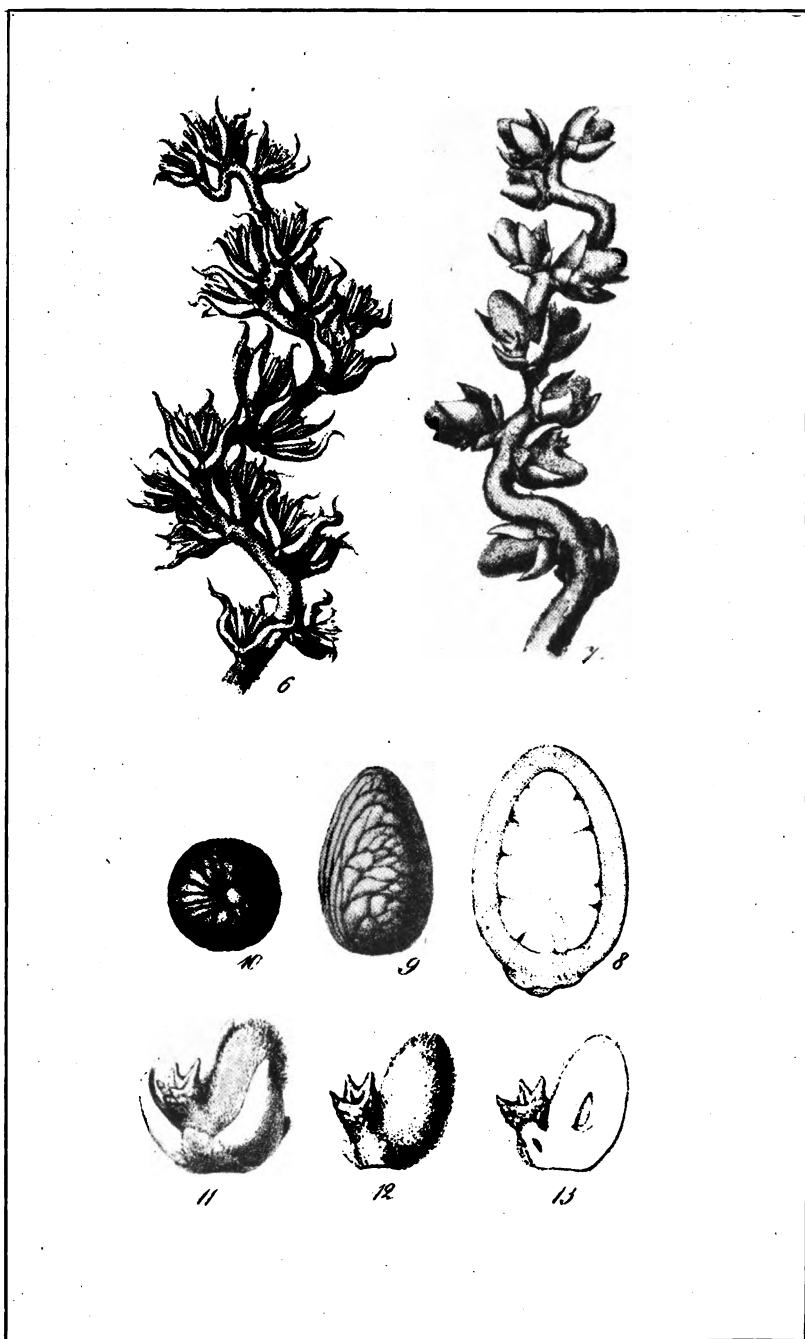
Spathes coriaceous, the interior ones complete, closed, at length opening on the ventral side, the exterior shorter, incomplete, imbricate, tubulous, open at apex.

Flowers sessile, without bracts, yellowish, monœcious in separate, simply branched spathes; male flowers in pairs; calyx of three triangular, fleshy, minute sepals, valvate in the bud; petals three, acute-triangular, fleshy, 8 times as long as the sepals; stamens 9 to 15, hypogynous, the filament free, filiform, the anthers linear, attached at the base, opening by two longitudinal slits; pollen grains round, echinate; pistillode very small; female flowers solitary, sepals and petals triangular, fleshy, the petals twice as long; staminodes few, rudimentary; ovary with 3 carpels, the ovules basal, solitary, rarely two, anatropous; stigmas three, sessile, beak-like, connivent.

Fruit ovate, somewhat wrinkled, green, at length blackish, of the size of a pigeon's egg, 1-celled and 1-seeded; albumen uniform, horny; embryo basal.



CATOBLASTUS PUBESCENS (KARST.) WENDL. AND C. PRAEMORSUS (WILLD.) WENDL.



FLOWERS AND FRUIT OF CATOBLASTUS PUBESCENS (KARST.) WENDL.

Flowers from June to October. Puerto Cabello, Colonia Tovar, Colombia. Moritz no. 914.

EXPLANATION OF PLATES 61, 62.—Plate 61, *Catoblastus pubescens* (Karst.) Wendl.; at the right a seedling of two years. Fig. 1, a pinna; fig. 2, an inflorescence; fig. 3, a male lower; fig. 4, an anther; fig. 5, a pollen cell. Figs. 14, 15, fruit of *Catoblastus praemorsus* (Willd.) Wendl. Reduced. Reproduced from Karst. Fl. Columb. 1: pl. 81. 1858-1861. Plate 62, flowers and fruit from the same plate at natural size. Fig. 6, tip of male inflorescence; fig. 7, tip of female inflorescence; fig. 8, section of fruit; figs. 9 and 10, views of the seed; fig. 11, female flower; fig. 12, same after removal of calyx and corolla segments; fig. 13, section of pistil.

As this species is the type of the genus *Catoblastus*, its characters are of special interest, but some of the most important are still in doubt. Klotzsch, and more recently Jahn, have described the carpels as distinct and with separate stigmas, and neither of these writers gives any intimation that the carpels are unequal at the time of flowering.

Karsten's *Iriarteia pubescens*,¹ which Wendland placed as a second species of *Catoblastus*, has the stigmas united into a short, cylindrical style, not half as long as the very large fertile carpel. The figure of *Catoblastus pubescens* given by Drude in Engler and Prantl's *Pflanzenfamilien* shows a long, columnar style rising above the fertile carpel and is likely to mislead regarding the principal generic character. Karsten says that the staminodia are wanting or very small and hidden under the carpels, whereas Drude's figure shows large staminodia with anthers. To avoid further confusion from this erroneous figure in so prominent a work of reference it may be best formally to recognize the fact that Drude's *Catoblastus* is a different species.² Unfortunately its origin is not indicated unless by the fact that Drude includes Peru in the range of the genus, while Venezuela is omitted.

It is also evident that the true characters of *Catoblastus* are not to be learned from Drude's account of the genus nor from Karsten's beautiful figures of *C. pubescens*. It is quite possible that one or both of these species will eventually be removed from the genus. For the present it may be sufficient to note that *C. pubescens* has an obvious alliance with our new genus *Catostigma*. The completely sessile stigmas of *Acrostigma* and the presence of the rudimentary male flowers on the female inflorescences afford apparent distinctions, but if they do not prove to be adequate, *C. pubescens* will need to be transferred to *Catostigma* instead of *Catoblastus* being united with *Catoblastus*.

The true affinities of *Catoblastus*, as represented by *C. praemorsus*, may lie with *Acrostigma* rather than with *Catostigma*, but the beak-like connivent stigmas indicated by Klotzsch do not suggest the condition found in *Acrostigma*.

Wendland and Drude both describe the albumen of the seeds of *Catoblastus* as ruminate, perhaps relying upon Karsten's drawing, but Klotzsch says that the albumen of *praemorsus* is uniform and describes the seed as marbled with numerous veins, which, however, may refer to the endocarp (*écorce*) rather than to the endosperm itself.



FIG. 41.—Ovary of *Catoblastus drudei* with fertile and sterile carpel, a staminode below. At the right, same in section. After Engler and Prantl.

¹ *Linnaea* 28: 262. 1856.

² *CATOBLASTUS DRUDEI*.

FIGURE 41.

Catoblastus pubescens Drude in Engl. & Prantl, *Pflanzenfam.* 2^e: 61. f. G1, G2. 1887, not *Iriarteia pubescens* Karst. 1856, nor *Catoblastus pubescens* Wendl. 1860.

There is no reason to doubt that Karsten's species *pubescens* is *ruminate*, but he gives us no indication of the origin of the still more strongly *ruminate* seed that he figured as representing *præmorsus* (see Pl. 59, Fig. 15). It is not to be assumed that Klotzsch would have called such a seed uniform.

The most recent account of this species is by Jahn¹ who gives additional data from Venezuela, probably based on palms growing near the original habitat of the species. Jahn's description may be translated as follows:

"This species is very abundant throughout the subalpine region (1,500–2,000 meters) of our Caralibe cordilleras where it is given the name 'prapa' by the indigenes. Its smooth cylindrical trunk reaches 6 to 8 meters in length and 10 to 15 cm. in diameter. The woody part is very hard, black, and heavy (specific gravity in dry state 1.25 according to Ernst) and incloses a soft central pith. Leaves few, pinnate, 2 meters long and composed of 10 to 20 pinnae on either side of the rachis or common petiole with a terminal pinna. The pinnae are alternate, herbaceous, pale green, situated some distance from each other, irregularly rhomboidal, toward the tip more or less deeply incised. The 6 to 8 longitudinal veins or nerves run parallel with the pinnae, and are prominent on the under side. Pinnae 20 to 30 cm. long by 6 to 3 cm. broad. The terminal leaf is triangular or in the form of a half-open fan, cuneiform at base and truncate or gnawed at the tip, whence comes the specific name *præmorsus*. The aerial roots form a pyramid of radiating pillars that gives strong support to the trunk. They are distinguished by their rough surface filled with spine-like protuberances that protect them from the herb-eating animals, principally the vaquira (Dicotyles) and the tapir (Tapirus) which inhabit the same region. The inflorescences have many spathes (10 to 12), fusiform, almost cylindrical, 20 to 25 cm. long and 5 to 6 cm. thick at the largest point, which is slightly below the tip. Inflorescences springing directly from the nodes of the trunk and not (as in the Iriarteas) from the base of the crown or leaves. Every spadix has 5 or 6 spathes, three interior and complete, closed until the time of flowering, and three exterior and shorter and incomplete; that is to say, always open at the upper end like short tubes. The flowers are seated in depressions, and are yellow and without bracts, the male and female on the same tree, but in different inflorescences. The male flowers have a three-parted calyx and a corolla of three triangular, somewhat fleshy petals, and have 9 to 15 stamens with free filaments and with anthers which split with two longitudinal apertures, this permitting the dispersion of the somewhat roughened pollen grains. The female flowers have the same number of sepals and petals as the male, with 4 to 6 staminodes. The ovary is three-celled, with the carpels very distinct, the style very short, and the three stigmas quite large, thick, with the interior somewhat channeled. The fruit is an egg-shaped berry with grumous pericarp, black, with a bluish luster, about the size of a pigeon's egg, inclosing a single seed. The 'prapa' flowers from August to October, and in the following April or May the fruits are mature."

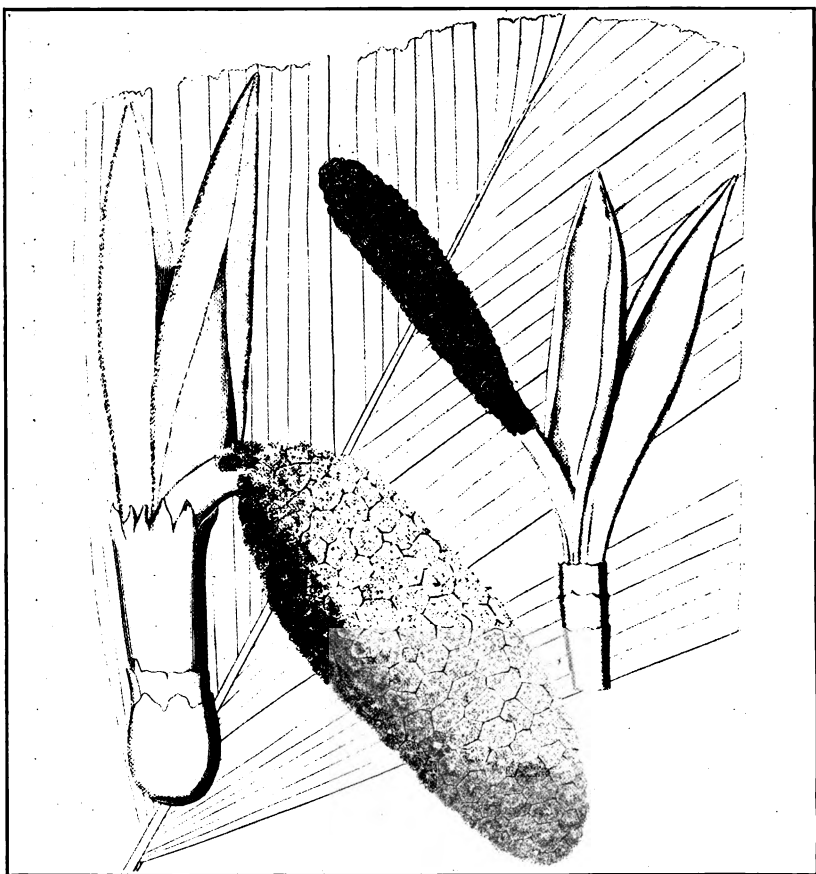
WETTINIEAE.

SYNOPTICAL KEY TO THE GENERA.

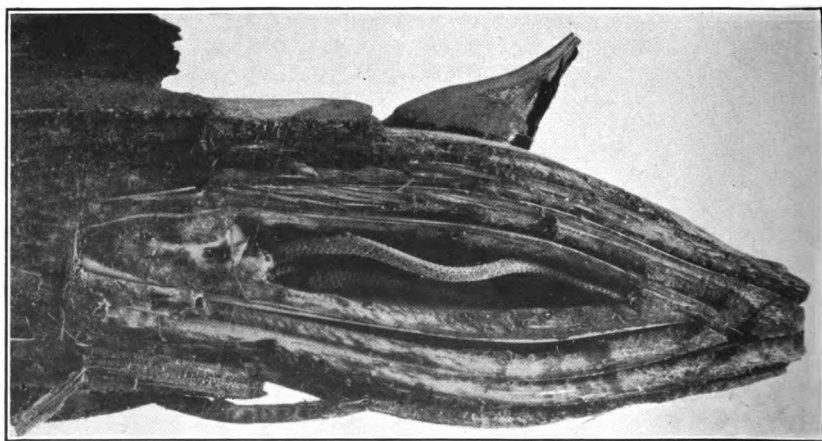
Inflorescences simple; many (8 to 15) from each node.. *WETTINIA* (p. 235).

Inflorescences with 4 or 5 branches; five inflorescences from each node but only the middle one maturing.. *WETTINELLA* (p. 235).

¹ Jahn, Alfredo, jr. Las Palmas de la Flora Venezolana 49–50. 1908.



A. *WETTINIA AUGUSTA* POEPP. & ENDL.



B. *WETTINELLA QUINARIA* COOK & DOYLE.

WETTINIA Poepp. & Endl.

Wettinia Poepp. & Endl. Nov. Pl. Poepp. 2: 39. pls. 153, 154. 1838;¹ Wendl. Bonplandia 8: 104-106. 1860.

Trunk solitary, 8 to 12 meters high, 15 to 20 cm. thick.

Leaves with opposite simple pinnæ.

Inflorescences simple, in verticillate clusters of 8 to 15, bearing flowers of one sex, but spathes of both sexes intermixed on the same trunk.

Spathes five, three short and two much longer and complete.

Male flowers with 4 or 5 minute sepals and 3 or 4 petals, valvate in the bud; stamens 12 to 16; female flowers with 3 sepals and 3 petals; staminodes?; ovary with 1 carpel and 1 ovule, obverse-pyramidate, villose; style filiform, rising at one side, from the base of the ovary; stigmas three, narrowly lanceolate.

Fruits obverse-pyramidate, flattened at the apex, strigose, hirsute, the endocarp delicately parchment-like.

Seed elliptical or obovate, surrounded with bundles rising from the base, running together to the apex, then laxly anastomosing and coming together again at the embryo; albumen solid, uniform; embryo basal, erect. (PLATE 63, A.)

Type species, *Wettinia augusta* Poepp. & Endl. loc. cit.; from the Huallaga Valley in eastern Peru.

EXPLANATION OF PLATE 63.—A. Male and female inflorescences of *Wettinia augusta* Poepp. & Endl. B. Young female inflorescence of *Wettinella quinaria* Cook & Doyle. A, reduced; B, natural size. A, reproduced from Poeppig and Endlicher; B, from a field photograph taken at Cordoba, Cauca, Colombia, December, 1905, by C. B. Doyle.

WETTINELLA gen. nov.

Trunk solitary, rather short (7 meters long), rather thick (12 to 20 cm.), becoming smaller above; smooth, distinctly ringed; internodes long (20 cm.).

Leaves with long (168 cm.) scurfy sheathes; petiole short (15 cm.); pinnæ lanceolate, not inserted on a fleshy pulvinus; segments of unequal length but not divided; upper surface nearly smooth; lower surface densely brown hirsute, more pronouncedly so on the ribs; terminal pinnæ deeply divided.

Inflorescences with 6 spathes, three small incomplete basal ones inserted close together and, well separated from these, three large complete ones, the latter inserted farther from each other; spadix compound, divided into several (about 4) rather short, thick, fleshy branches which bear flowers of one sex densely crowded together; surface of spadix below the flowers densely hirsute; flowers monœcious in different inflorescences, usually one female inflorescence and two to four male inflorescences at each node.

Fruits obovate, variously flattened and angled by mutual pressure, as broad as long or narrower, the surface rather coarsely wrinkled on the exposed end and densely beset with minute tubercles each bearing a long hair; style persistent, woody, inserted some distance (about 8 mm.) above the base of the fruit and bearing three linear, compressed, grooved stigmas equal in length to itself and scarcely exceeded by the apex of the ripe fruit; mature calyx and corolla also nearly as long as the fruit, the petals narrower and slightly longer than the sepals, the latter united at the base, the petals distinct; mesocarp of rather firm corky texture, thicker at broadest part of fruit; inside coat of mesocarp a thin

¹ The Index Kewensis credits this genus to Poeppig alone, with a reference to Endlicher's Genera Plantarum (p. 243) with the date 1837. But Endlicher's account of the genus contains no reference to a species that could serve as a type.

membrane traversed by numerous web-like fibers; endocarp also a thin membrane traversed by numerous fragile fibers.

Seed oval, larger above the middle; seed coat a very thin membrane, delicately fibrous; albumen uniform; embryo basal, protected by a fragile, rather fleshy cap, the flattened, disk-like outer end of the embryo attached to the cap; embryo cavity large, conical.

Type species, *Wettinella quinaria*.

Distinguished from *Wettinia* Poepp. by the compound spadix and the very large sepals, broader than the petals and nearly as long.

Wettinella quinaria sp. nov.

PLATES 54 (B), facing p. 230, 56 (C), facing p. 230, 63 (B), facing p. 235, 64, 65.

Trunk 7 meters long, 12 to 20 cm. in diameter 1 meter from base; internodes 20 cm. long; surface smooth.

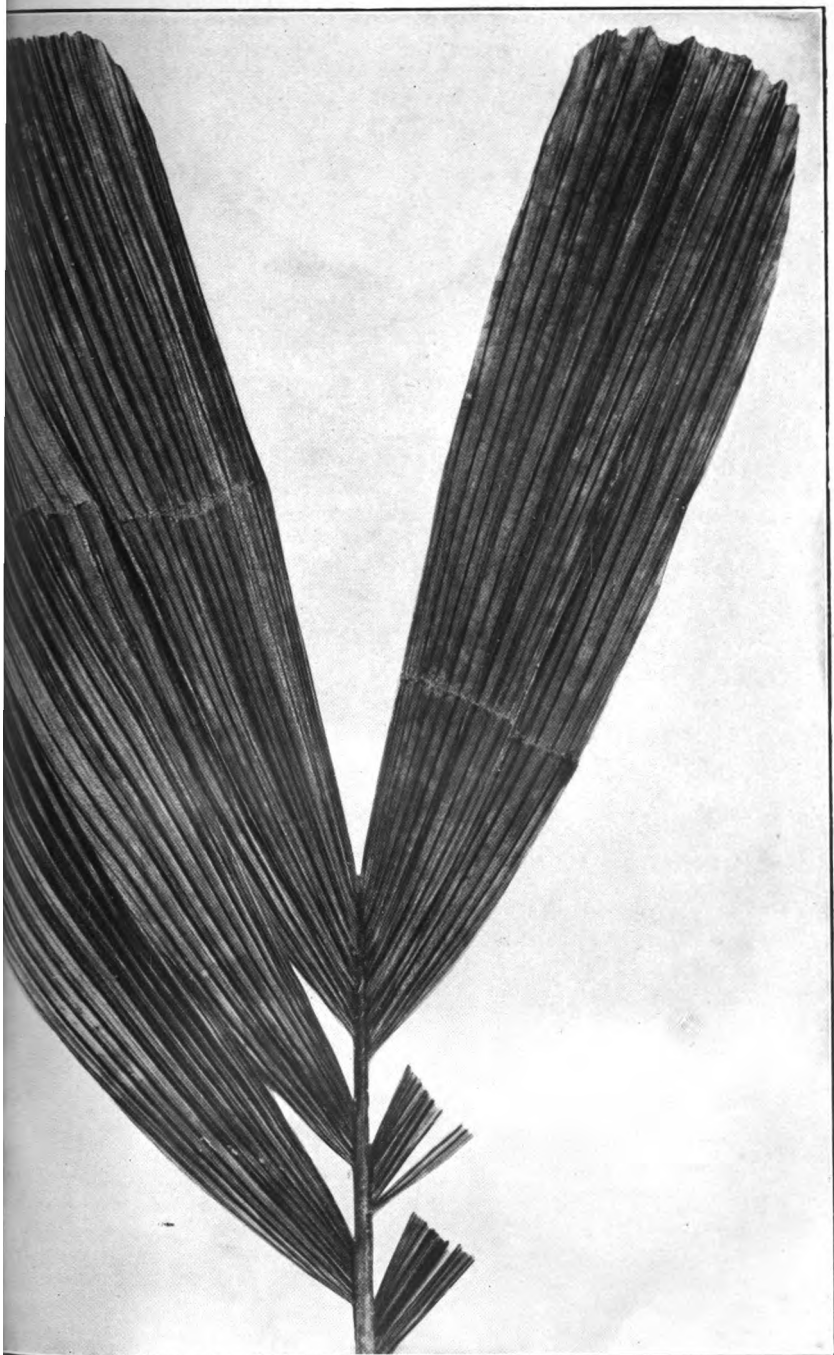
Leaves pinnate, 12 to 15 in a head, largest below the middle; leaf bases woody, 168 cm. long by 34 cm. wide at base, splitting into coarse, strong fibers; surface covered with a very closely adherent grayish scurf; with age the leaf bases becoming black and deeply wrinkled; young bases pale blue; petiole very short (15 cm. long) by 3 to 4 cm. in diameter; lower surface rounded, covered with grayish scurf like that on base; upper surface with deep central groove 1.5 cm. wide and 1 cm. deep.

Rachis 315 cm. long by 3.4 cm. broad at base, the deep groove of the petiole gradually becoming a broadly rounded ridge 1 cm. in width; on either side this central ridge paralleled by rather deep grooves, the pinnæ inserted in these; toward the tip of the leaf the grooves becoming flattened and the central ridge more prominent and rather sharp; lower surface rounded, flattening toward the tip, tomentose, except a narrow strip along the center, this smooth and light colored; central ridge and grooves of the upper surface covered with a rich brownish tomentum becoming grayish toward the tip; upper surface also marked with longitudinal striæ 1 mm. apart, distinct at base, gradually disappearing toward tip; just below the insertion of each pinna the rachis bare and smooth for 4 cm. or less.

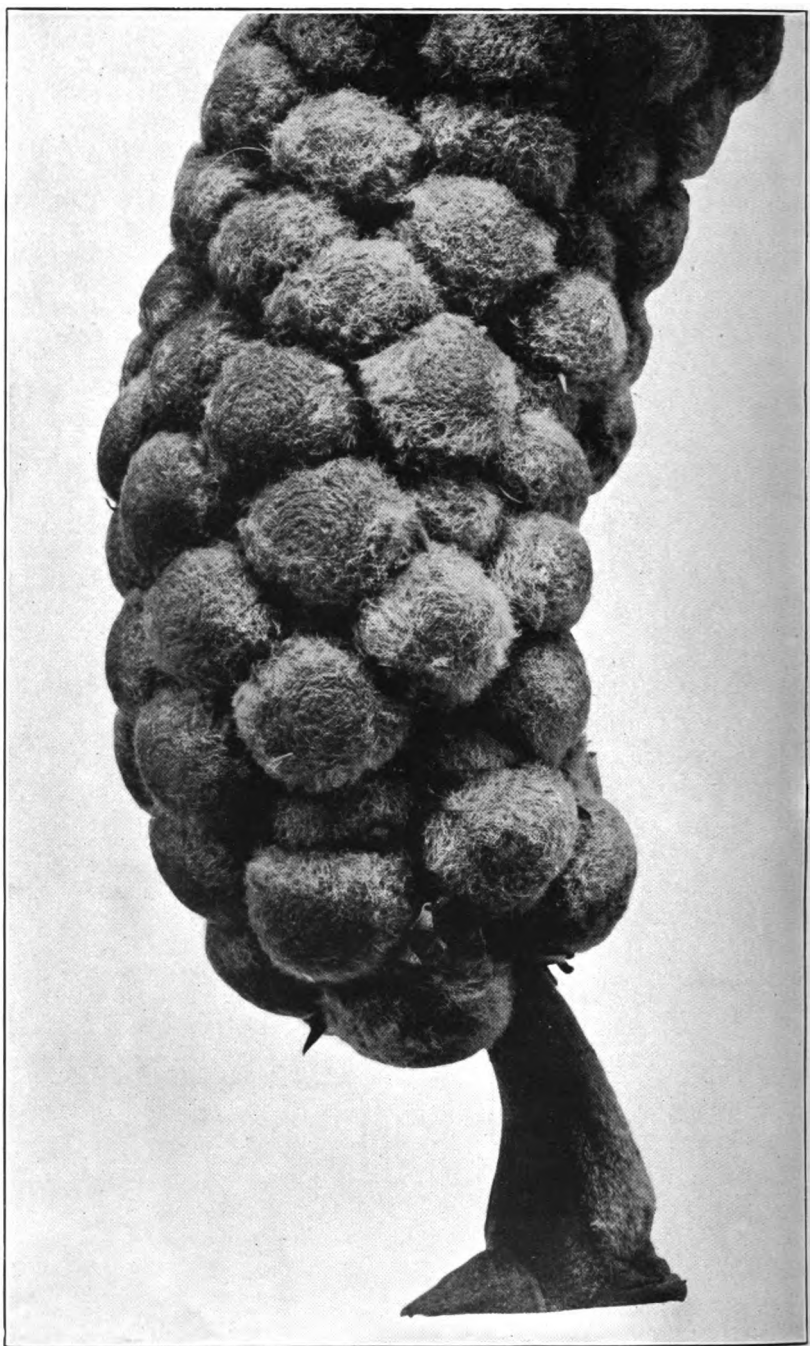
Pinnæ 40 to 44 on each side, divided irregularly into 3 to 20 segments, 12 mm. or less in width; upper surface dark green, covered for 15 cm. or less outward from point of insertion with tomentum like that found on lower part of rachis; on the pinnæ of the upper half of the leaf the tomentum changing to a light gray color and extending for only 2 cm. or less; lower surface of pinnæ of slightly lighter shade than the upper and very densely covered with reddish brown tomentum about 1 mm. in length; all the prominent veins more densely tomentose; lowest segments the longest in some pinnæ and the central ones in others, each segment notched at the apex, giving the whole margin a very ragged appearance; toward the end of the leaf the segments becoming more nearly equal in length.

Lowest pinnæ very small, scarcely 10 cm. in length and only 2 cm. broad at widest part, 1 cm. at base, consisting of 3 or 4 narrow segments; second pinnæ larger, 58 cm. long, 6 cm. wide just below the middle, consisting of 10 segments, each less than 1 cm. in width; middle pinnæ 112 cm. long by 10 to 11 cm. in width and 3 cm. at base, consisting of 16 narrow segments, the widest only 1 cm. wide; terminal pinnæ 40 cm. long by 4 to 8 cm. in width and 3 to 9 cm. at base, consisting of 11 to 16 segments, less than 1 cm. in width; largest pinnæ found between the base and the middle of the leaf, reaching a length of 110 cm. and a width of 14 cm. and consisting of about 20 segments.

Spathes 6, woody, covered with reddish hairs.



WETTINELLA QUINARIA COOK & DOYLE.



WETTINELLA QUINARIA COOK & DOYLE.

Inflorescences infrafoliar, five from one node, one or two female, the rest male; total length of female inflorescence 75 cm.; peduncle 36 cm. long by 8 cm. in diameter at base, abruptly narrowing to 2 cm., then widening again to 4 cm. at base of first branch, densely covered with light brownish tomentum, this more pronounced toward the base; branches 4, 39 cm. or less in length, 7 cm. in diameter at point of insertion, abruptly narrowing just above.

Fruit densely crowded along the branches, quadrangular top-shaped by mutual pressure, 2.5 cm. long by 2 to 2.5 cm. in diameter at widest point; densely gray-tomentose; outer shell corky, 1 to 3 mm. thick; seed oval, broadest above the middle; embryo basal.

Type in the U. S. National Herbarium, nos. 690424, 690425, 690433 (all from one tree), collected in deep damp forests about Cordoba, Cauca, Colombia, about 10 miles inland from Buenaventura, by C. B. Doyle, in December, 1905.

Native name, "gualte."

EXPLANATION OF PLATES 64, 65.—Plate 64, tip of leaf of *Wettinella quinaria*. From photograph of a dried specimen taken in Washington by C. B. Doyle. Reduced. Plate 65, branch with fruit of *Wettinella quinaria* Cook & Doyle. From field photograph taken at Cordoba, Cauca, Colombia, December, 1905, by C. B. Doyle. Natural size.

Wettinella maynensis (Spruce).

Wettinia illaqueans Spruce, Journ. Linn. Soc. Bot. 3:191. 1859.

Wettinia maynensis Spruce, Journ. Linn. Soc. Bot. 3:191. 1859; 11:130. 1869.

Notes Bot. Amazon & Andes 2: 136, 443. 1908; Kew Bull. Mis. Inf. 1909: 221. 1909.

This palm was described by Spruce as a second species of *Wettinia*, the differential characters being stated as follows:

"*Wettinia maynensis* differs from *W. augusta* chiefly in the more numerous pinnae (38-40 pairs, while in *W. augusta* they are but 18-20 pairs), and in the spadices, which are only three from one leaf-ring, and put forth 5-8 fastigate branches at their apex; while in *W. augusta* they are simple, and as many as from 8 to 15 grow from the same ring. There is a further difference, in the spathes, which in *W. maynensis* are 6 in number, the three outer (corresponding to what are called by Martius in other genera 'spathae incompletae') much smaller, and persisting on the peduncle in the form of sheaths; while the three inner and larger ones ('spathae completae') fall away before the fruit is ripe, or persist only in fragments. In *W. augusta* the spathes are said to be two, and the peduncle is said to be furnished with remote coriaceous sheaths—undoubtedly the remains of the incomplete spathes. In both specimens the sepals vary in number, and the stamens are from 12 to 16, nor does there seem to be much difference in the form of the fruit; but in *W. maynensis* the arilliform raphe is in every stage thin and papery, while in *W. augusta* it is fleshy. In Endlicher's description, the scale-like external sepals are considered bracts; but as they quite correspond to what are called sepals in other palms, I describe them as such."¹

It would seem that Spruce's palm is more closely allied to our *Wettinella quinaria*, which has a branched spadix, and it is therefore placed as a second species of this new genus. Its chief characters which separate it from *quinaria* lie in the fewer inflorescences from each node, 3 instead of 5, and in the much shorter sepals and petals. Spruce says that in *W. maynensis* the female spadix is very constantly 5-branched, while in *W. quinaria* there are only 4 branches. The following additional details are given by Spruce, mostly in the form of a long Latin description:

Habitat in the shady valleys of the Andes of Maynas in eastern Peru.

¹ Spruce, Richard. Five New Plants from Eastern Peru. Journ. Linn. Soc. Bot. 3: 192. 1859.

Trunk erect, unarmed, 30 to 40 feet tall, 4 inches in diameter; internodes 4 inches long; leaves 5 or 6 in a head; leaf sheath $3\frac{1}{2}$ feet long, smooth; rachis $9\frac{1}{2}$ feet long, triangular above, rounded below, pinnate to the very base, somewhat channelled but only at the base; pinnæ 38 to 40 pairs, about equidistant, the lowest very minute, the middle 3 feet long with a breadth of 3 inches, inserted at an angle of 40 to 50 degrees; base semivertical, reduplicate; apex obtuse or truncate, premorse; outer margin and apex with premorse or sub-acute teeth.

Inflorescences clustered, 3, one female and two male rising in the same axil, those with ripe fruit usually on the fourth ring below the leaves; spathes 6, three complete, three incomplete; outer incomplete spathes 4 inches long, inner 11 inches long, 3 inches broad, fusiform; spathes covered with appressed hairs.

Male inflorescence with 8 simple branches 6 inches long, twisted to the left in the early stages before flowering, afterwards nearly straight, densely covered with flowers; sepals scale-like, short, rigid, chestnut colored, valvate in the bud, 3 to 5 (for the most part 4), broadly subulate, rather obtuse, a line long, free or sometimes 2-parted; petals 3, very long (7 lines), narrowly subulate, subflexuous; stamens 12 to 16, usually 13; anthers 4 lines long, obtusely 4-angled, 2-celled, attached a little above the base to a short, subulate, compressed filament $\frac{1}{2}$ to 1 line long; longitudinally dehiscent, covered with white, flexuous, deciduous hairs, the slender connection produced into a somewhat curved point; pollen lobes smooth.

Female inflorescence similar to the male; branches 5 to 7, crowded, 8 inches long, diameter including fruit almost 4 inches; sepals 3, 2 to 3 lines long, subequal; petals 3, 5 to 6 lines long; ovaries 3, oval, $3\frac{1}{2}$ lines long, united to each other and with the style; ovule single from the internal angle of the base, almost erect, sessile, anatropous; style single, central, 7 lines long, subulate, sometimes 3-angled, villous for the most part, with the abortive ovaries at the base of the ovule rarely deciduous; stigmas 3, terete, erect, flexuous, 3 lines long.

Fruits 1-seeded, dry and crowded on the spadix, 3 to 6-angular by mutual pressure, obpyramidal, the apex broadly convex, covered with ashy hairs; pericarp softly woody, rather delicate, thicker at apex; endocarp membranous, adhering to the vessels of the raphe; seed 11 by 6 lines, narrow below, obovate-subtriangular; testa thin, firm, blackish, marked from the base to the apex with the delicate raphe and reticular with the flattened white adherent fibers of it grown together with the kernel; albumen uniform, somewhat bony; embryo in basal cavity, conical-cylindrical, directed toward the center of the seed.

In a more recent publication of Spruce's field notes is the following paragraph on this palm:

"*Wettinia maynensis* (Palmae) is now very frequent and grows occasionally close by the margin, along with the *Iriarteas*, from which it is distinguished at sight by the pinnæ being equidistant and all spreading out from the rachis horizontally, but pendulous (from their weight) toward the apex, so that the entire frond has a widely channelled form. In the *Iriarteas* the laciniae of the pinnæ are in fascicles, the uppermost of each fascicle standing out above the rachis, the lowest pendulous, the rest at intermediate angles. Female spadix very constantly five-branched."¹

¹ Kew Bull. Misc. Inf. 1909: 221. 1909.

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